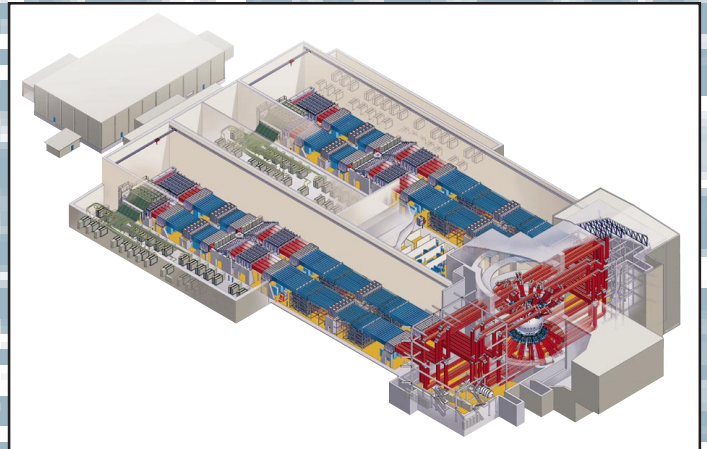


# CREATING THE LABORATORY'S FUTURE

## A Strategy for Lawrence Livermore National Laboratory



September 1997  
University of California  
Lawrence Livermore  
National Laboratory



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# DIRECTOR'S STATEMENT

*Creating the Laboratory's Future* describes Livermore's roles and responsibilities as a Department of Energy (DOE) national laboratory and sets the foundation for decisions about the Laboratory's programs and operations. It summarizes Livermore's near-term strategy, which builds on recent Lab achievements and world events affecting our future. It also discusses our programmatic and operational emphases and highlights program areas that we believe can grow through application of Lab science and technology. *Creating the Laboratory's Future* reflects our very strong focus on national security, important changes in the character of our national security work, major efforts under way to overhaul our administrative and operational systems, and the continuing challenge of achieving national consensus on the role of the government in energy, environment, and the biosciences.

Since we prepared *Framing the Laboratory's Future* in June 1994, significant events have reaffirmed and further clarified Livermore's important national security responsibilities. Livermore is a crucial element in an integrated national program to maintain confidence in the safety and reliability of the U.S. nuclear stockpile in the absence of nuclear testing. As we move from the weapon-development paradigm of the Cold War (design, test, and build) to a weapon-assurance paradigm (stockpile surveillance, assessment, and remanufacture), we must greatly increase our reliance on understanding the underlying science and technology of nuclear weapons performance. To meet Livermore's responsibilities for the nuclear weapons stockpile,



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the Lab is acquiring new tools—advanced supercomputers as part of the Accelerated Strategic Computing Initiative, the National Ignition Facility for laboratory thermonuclear physics experiments, and improved diagnostic capabilities for enhanced surveillance of the stockpile.

Livermore is also supporting the DOE and other U.S. government agencies in activities to halt the spread and prevent the use of weapons of mass destruction. Science and technology are also key to these efforts; the invention and application of technology defines the limits of what is possible in terms of actions, policies, and treaties.

In *Creating the Laboratory's Future*, we discuss how our national security capabilities and our internal investments will provide a strong infrastructure and workforce for the Laboratory and a valuable national resource of science and technology. We are applying this resource to projects that clearly meet long-term national needs and require the approach and capabilities of a national laboratory. For example, the stewardship of nuclear materials involves nonproliferation, environmental clean-up and waste management, and civilian

The Beamlet laser (cover) is a scientific prototype for one of the 192 beamlines of the National Ignition Facility (left), a key element in the nation's program to ensure the safety and reliability of the U.S. nuclear weapons stockpile. The National Ignition Facility is being constructed at the Livermore site.

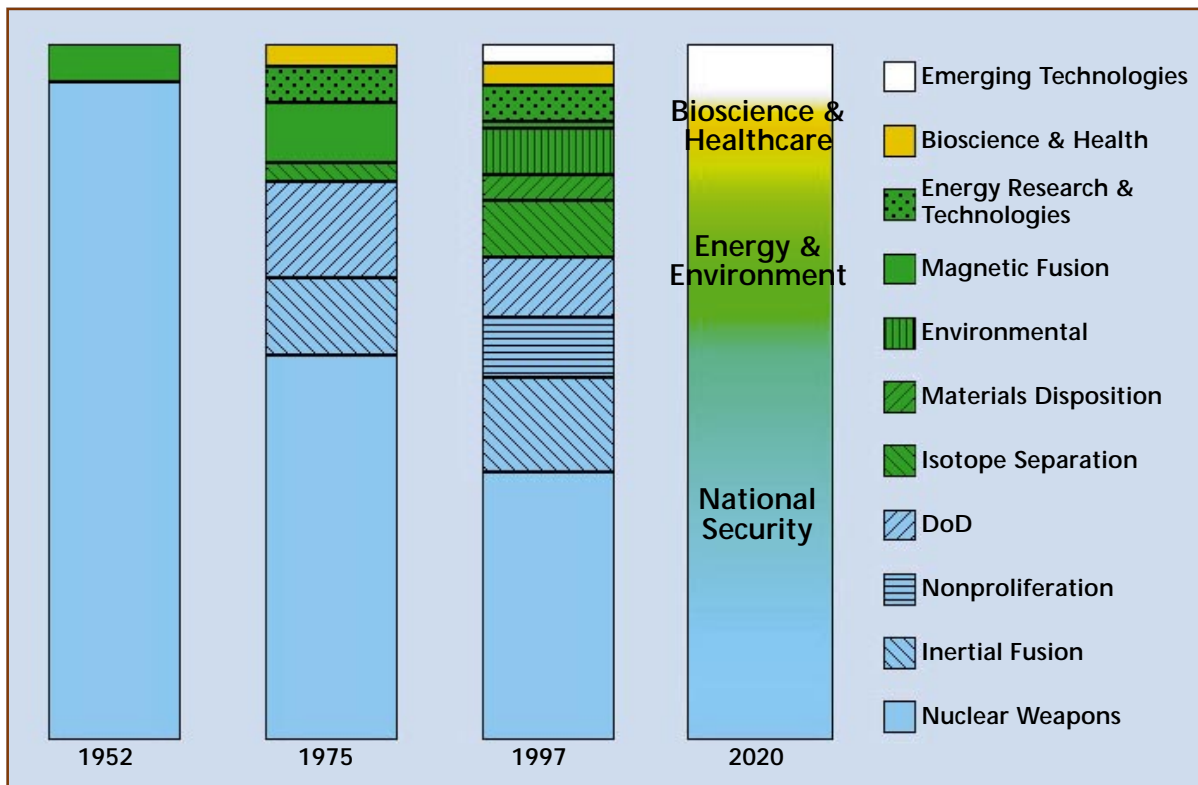
nuclear power—all central to DOE’s mission. Similarly, understanding the long-term impact of energy usage on the climate is a Departmental responsibility. In the biosciences, where DOE has a lead role in mapping the human genome, the nation faces comparably important challenges that require the special multidisciplinary capabilities and milestone-driven character of Livermore.

In many of these areas, we are involved in collaborations as the means to accomplish our goals, an expansion of the original E.O. Lawrence model of team science. Increasingly, our DOE programs are conducted in multilaboratory partnerships, ranging from national security to the basic sciences. Our many collaborations with academia include efforts that are leading to important discoveries in disciplines such as astrophysics and activities that will underpin scientific capabilities needed for our national security programs. We are excited about the growth of major partnerships with industry, such as interactions with computer manufacturers,

commercialization of the use of lasers to enrich uranium for reactors, and the pursuit of lithography technologies needed to produce the next generation of computer chips. Over the next several years, we will gain considerable experience operating in the complex partnerships that now characterize our work with other laboratories, industry, and universities—and better understand how to design such relationships for the future.

Success in Livermore’s technical programs depends on safe and environmentally sound operations, with safety continuing to be the cornerstone of our operational philosophy. In all of our operations, we are benefiting from the performance-based management approach, which is fostering a close working relationship among Livermore, the University of California, and the DOE. On the business side, we’ve redesigned our financial system and implemented a major cost-cutting initiative. The Laboratory also conducted an extensive evaluation of human resource issues, which we are using as a basis for steps designed to enhance career opportunities, ensure a better

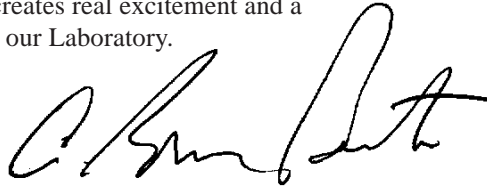
### *Livermore’s Programmatic Evolution*



trained workforce, and create an environment in which diversity is recognized as a Laboratory strength.

*Creating the Laboratory's Future* describes planned activities and initiatives over the next several years. Our 10- to 25-year future is largely beyond the planning horizon of this document. In part this is because the rate of technological change is so rapid, and in part because the debate over post-Cold War research and development priorities is still very much in progress. Consequently, we indicate in the graph of the Laboratory's programmatic evolution an "emerging technologies" component of the Lab's programs in 2020. We intend to charter a long-range planning group to consider the needs and prospects for science and technology early in the next century and to assess the implications for the Lab.

The opportunity and responsibility to shape the future with science and technology continues to be the challenge that creates real excitement and a sense of purpose at our Laboratory.



Laboratory Director Bruce Tarter, Assistant Secretary of Energy for Defense Programs Victor Reis, and Secretary of Energy Federico Peña (left to right) confer at the National Ignition Facility groundbreaking on May 29, 1997.

# WHAT MAKES A NATIONAL LABORATORY

- ***An essential and compelling core mission.***

- The national interest is at stake.
- Enduring national needs provide program continuity and enable long-term research efforts.

- ***The ability to solve important, difficult, real-world problems.***

- Problems stretch capabilities and call for new approaches.
- Solutions have a substantial impact.

- ***Cutting-edge capabilities in multiple areas of science and technology.***

- The research involves and integrates many disciplines.
- Multidisciplinary efforts produce a whole greater than the sum of the parts.

- ***Science and technology that create spin-off applications.***

- Advances made for specific purposes lead to breakthrough applications in other fields.
- The spin-offs leverage the laboratory's intellectual and institutional investments.

- ***Unique, large, and complex research facilities.***

- Expanded research opportunities enable advances in science and attract diverse users.
- The capabilities foster multidisciplinary collaborations and effective partnerships.

- ***A committed, vital, and talented staff.***

- Opportunities to do state-of-the-art work attract and sustain a talented staff.
- The culture motivates and rewards risk-taking to produce results that matter.
- Stable but evolving programs build continuity in knowledge and foster career growth.

- ***Partnerships that promote creativity.***

- Collaborations provide broad applications for new technology.
- Training the next generation of researchers ensures future vitality and infuses new ideas.

- ***Management, business practices, and operations that support mission goals.***

- Safe operations make progress possible in research projects with inherent technical risks.
- Managers provide visionary leadership and follow cost-effective, sound business practices.
- Prudent internal investments maintain the health of facilities and operations.



Lawrence Livermore National Laboratory is managed by the University of California for the U.S. Department of Energy.

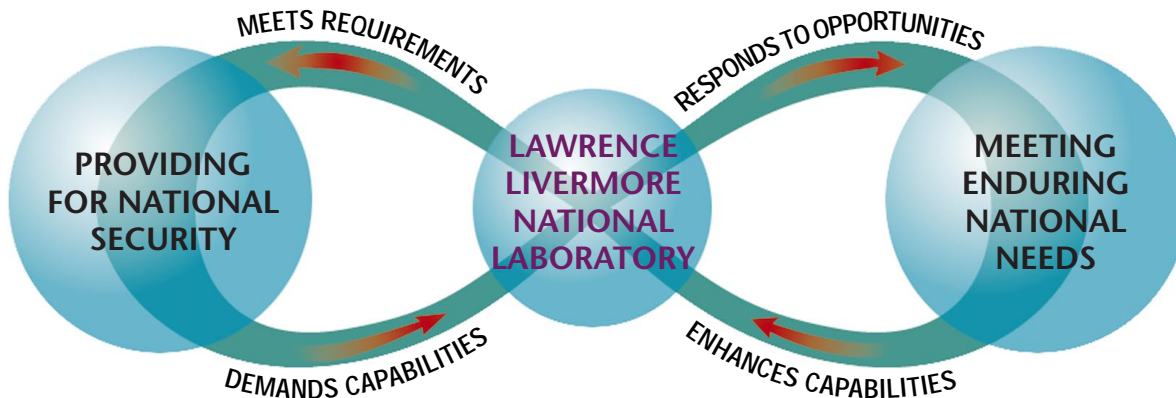
# MISSION

Lawrence Livermore National Laboratory is a premier applied-science national security laboratory.

Our primary mission is to ensure that the nation's nuclear weapons remain safe, secure, and reliable and to prevent the spread and use of nuclear weapons worldwide.

This mission enables our programs in advanced defense technologies, energy, environment, biosciences, and basic science to apply Livermore's unique capabilities, and to enhance the competencies needed for our national security mission.

The Laboratory serves as a resource to U.S. government and a partner with industry and academia.



# VISION AND GOALS

**O**ur goal is to apply the best science and technology to enhance the security and well-being of the nation and to make the world a safer place.

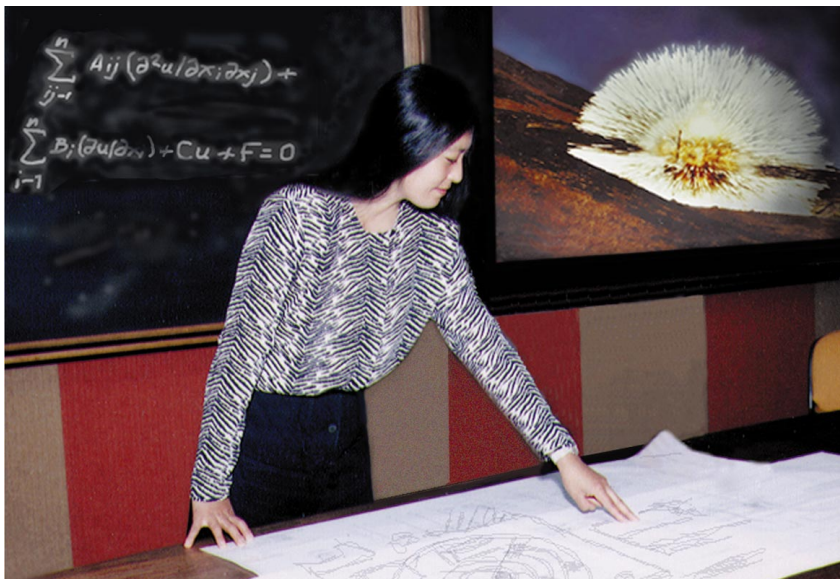
National security is the defining responsibility of Lawrence Livermore National Laboratory. We are focusing the Laboratory's efforts on two of the nation's top priorities: ensuring the safety, security, and reliability of the U.S. nuclear stockpile and preventing and countering the proliferation of weapons of mass destruction. We will provide the first-class scientific and engineering capabilities that help to make it possible for the U.S. to maintain the national deterrent while taking major steps in international nuclear arms control and arms reduction.

The realization of a world without nuclear testing—but with remaining dangers that keep nuclear deterrence and nonproliferation as central elements of U.S. security strategy—presents new challenges. As part of an integrated national effort, we must make significant advances in science and technology to maintain confidence in

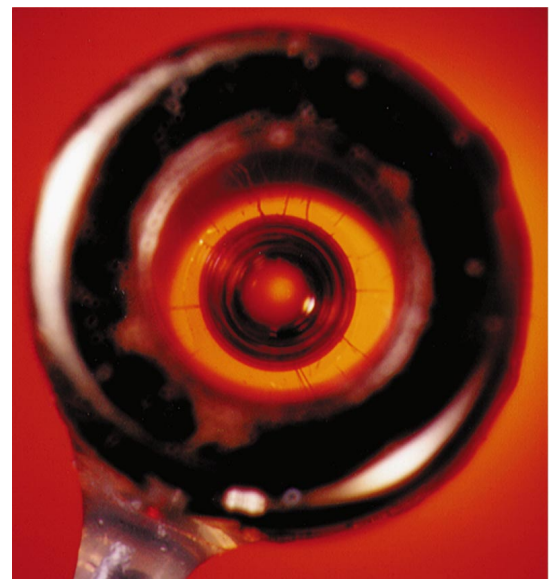
the U.S. nuclear stockpile under a Comprehensive Test Ban Treaty. Drawing on these advances and the special expertise of the Laboratory, we will also work with various U.S. government agencies to halt and prevent the use of nuclear, chemical, and biological weapons by developing needed technologies and analysis tools. In addition, Livermore will continue to apply its scientific and engineering capabilities to develop advanced defense technologies to increase the effectiveness of U.S. military forces.

Investments are being made at the Laboratory in computational and experimental tools that are needed to help ensure that the U.S. nuclear weapons stockpile remains safe and reliable. Livermore will have scientific computing capabilities that offer the potential for revolutionary

A Livermore physicist examines revalidation reports as part of formal activities to ensure continuing confidence in the safety, reliability, and performance of nuclear weapons in the stockpile.



Microfusion targets about 3 millimeters across will be used at the National Ignition Facility to help resolve issues about the performance of nuclear weapons and to reach important goals in fusion energy research.



advances in many areas of science and technology as we make necessary improvements to simulation models of nuclear weapon performance. Livermore is also the site for the National Ignition Facility, which will be the world's largest laser system and will provide the means for investigating the thermonuclear physics of weapons in the absence of nuclear testing and for exploring the promise of fusion energy. These major investments shape the future of the Laboratory.

An exceptional staff with state-of-the-art research capabilities will enable the Laboratory to respond to a broad range of vital national needs. With Livermore's emphasis on high-payoff results, many projects will entail significant scientific and technical risk. We seek such challenges and will contribute where Laboratory efforts can lead to dramatic benefits for the nation.

Our special focus will remain on the critical, enduring missions of the Department of Energy and program areas that positively reinforce our national security work. Livermore will pursue

projects aimed at significant, large-scale innovations in energy production to ensure abundant, clean, and affordable energy for the future. Environmental efforts will be directed at demonstrating effective remediation technologies, advancing the science base for environmental regulation, and modeling more accurately regional weather and global climate conditions. We will also serve as an effective national technical resource in the stewardship of nuclear materials. The Laboratory's bioscience research will advance human health through efforts focused on genomics, disease susceptibility and prevention, and improved healthcare and medical biotechnology. In other fields, Livermore researchers will pursue science and technology initiatives that have the potential for major advances and that bolster the Laboratory's scientific and technological strengths.

The foundation for this diverse set of programs—now and in the future—is the Laboratory's science and technology base, which we will sustain through effectively managed internal investments. Excellence in science and technology will keep the Laboratory vibrant and healthy and able to respond to new challenges. Livermore's scientific and technological achievements will be made possible by safe and efficient operations and sound business practices. Increasingly, accomplishments will be achieved through effective partnerships with others.



Livermore has taken delivery of the first elements of our new supercomputer for stockpile stewardship. The IBM SP also enables us to make major advances in scientific computing for other applications.